



ATTORNEY DOCKET NO. HUANG 11-1-10

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Gang Huang, *et al.*

Serial No.: 09/909,394

Filed: July 19, 2001

Title: SYSTEM AND METHOD FOR RECOGNIZING ZERO-AMPLITUDE SYMBOLS IN A QAM SIGNAL AND DIGITAL RECEIVER INCORPORATING THE SAME

Grp./A.U.: 2634

Examiner: Sudhanshu C. Pathak

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313, on 08/21/05 (Date)	
DEBATE SAMS (Printed or typed name of person signing the certificate)	
Debate Sams (Signature of the person signing the certificate)	

Sir:

AFFIDAVIT UNDER 37 C.F.R. §1.131

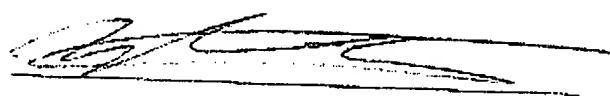
I, Zhenyu Wang, hereby state:

1. I am an inventor of the claimed subject matter in the Patent Application identified above and an inventor of the subject matter described therein.
2. Prior to April 18, 2001, my co-inventors and I participated in the conception of recognizing zero-amplitude symbols in a QAM signal, as covered by the above-identified Patent Application, as evidenced by the following:
 - a. We submitted an invention submission form, which is kept in the regular course of

business, for a patent application disclosing our conception of the invention prior to April 18, 2001, and after the date of conception. A true and correct copy of this invention submission form is attached hereto as Exhibit A. Thereafter, we participated in preparing information necessary for subsequent filing of the above referenced Patent Application in the United States, which was diligently prepared and filed with the United States Patent Office on July 19, 2001, as evidenced by Exhibits B-D.

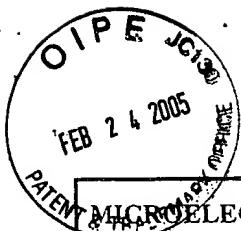
b. The dates omitted from Exhibit A are prior to April 18, 2001.

3. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the Application or any patent issuing thereon.



Zhenyu Wang

Date: 2/18/2005



MICROELECTRONICS PATENT COMMITTEE INVENTION SUBMISSION

Names of Submitters	Telephone No.	LOC/Room	Organization	E-Mail address
Gang Huang	(732)949-2919	HO/1E323	BL0314200	Gang@bell-labs.com
Jerry Zhenyu Wang	(732)949-5820	HO/1L-422	538565000	zhenyuwang@lucent.com
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IDS: 123586

Mark A. Kurisko

TITLE: A Gap Detector for HPNA Compatibility Mode

Problem(s) addressed by the invention:

In HPNA compatibility mode operation, the data frames are divided into small fixed-length subframes with fixed length zero-amplitude symbols (gaps) inserted in between. All subframes except the last are of fixed length. The last subframe is followed by a sequence of EOF symbols. It is necessary to reliably detect the end of a subframe and the beginning of the zero-amplitude symbols. This invention proposes such a method.

DESCRIPTION OF THE INVENTION

Summary:

The zero-amplitude symbols are detected when the complex amplitude of a number of consecutive symbols fall within a pre-determined region.

Detailed description:

Figure 1 illustrates a typical QAM digital communication receiver. The signal on the line is converted to digital samples. The digital equivalent of the analog signal is then demodulated and equalized to remove the impairments introduced in during the transmission. A slicer is then used to estimate the original symbols sent by the transmitter. The function of the slicer can be described by what is called signal constellation exemplified in Figure 2.

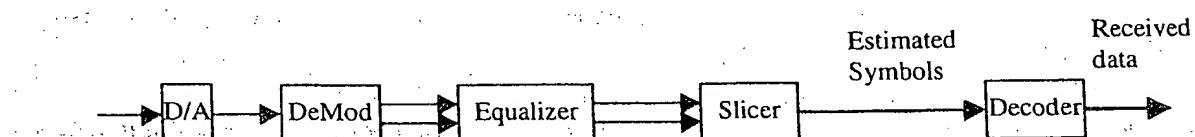


Figure 1. A typical communication Receiver

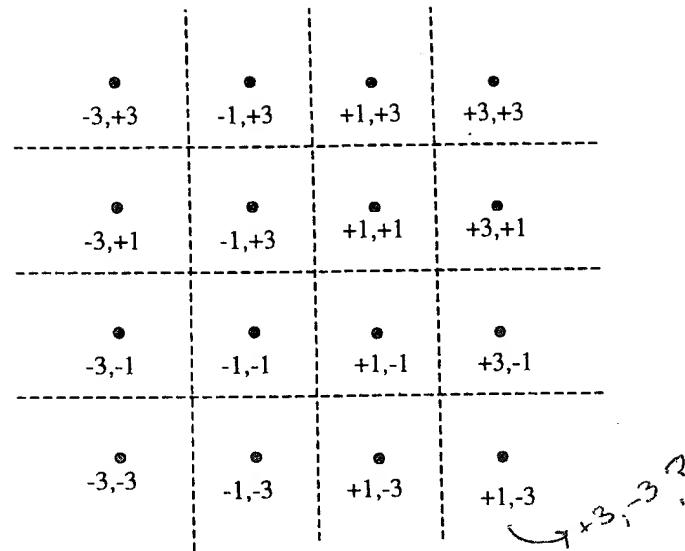


Figure 2 A 16-QAM signal constellation

The received symbols are estimated according to which of the 16 squares it falls into. For example, if the received symbol value is $+2.5, -0.9$, it would then fall into the square $+3, -1$, and $+3, -1$ is the estimated transmitted symbol amplitude. To detect the zero-amplitude symbol $(0,0)$, we can modify the conventional signal constellation as follows. When ever the received symbol falls in to a small area highlighted in the center, the symbol is considered as zero-amplitude symbol. The modified constellation is illustrated in Figure 3

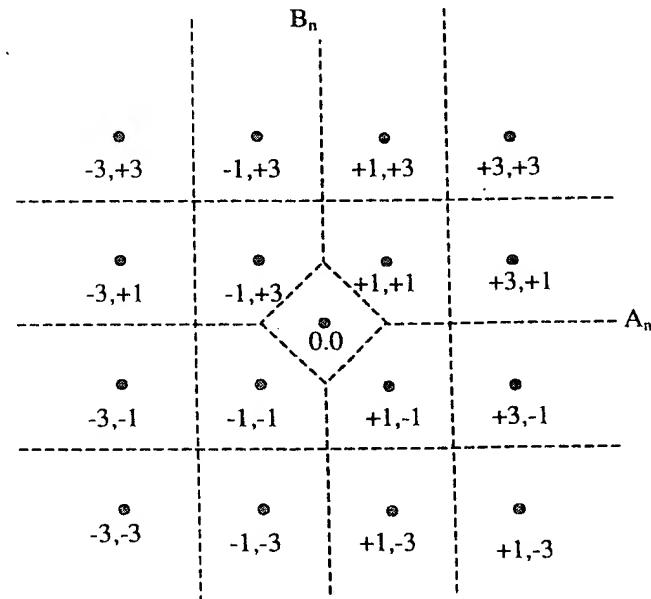


Figure 3 16-QAM signal constellation with zero amplitude symbol

In implementation, the zero-symbol is qualified as

if $A_n > 0$ and $B_n > 0$, $A_n + B_n < 1$	correct
or if $A_n > 0$ and $B_n < 0$, $A_n - B_n < 1$	correct
or if $A_n < 0$ and $B_n < 0$, $A_n + B_n > -1$	correct
or if $A_n < 0$ and $B_n > 0$, $A_n - B_n < -1$	incorrect

>

Conventional approach

- Conventional slicer uses a simple slicer table only, which uses a rectangular area in constellation to detect zero-attitude symbol, as shown in figure 4.
- This new method uses a linear algorithm based slicer instead of conventional slicer table only. The new method can reach up to 3dB S/N improvement over conventional approach.

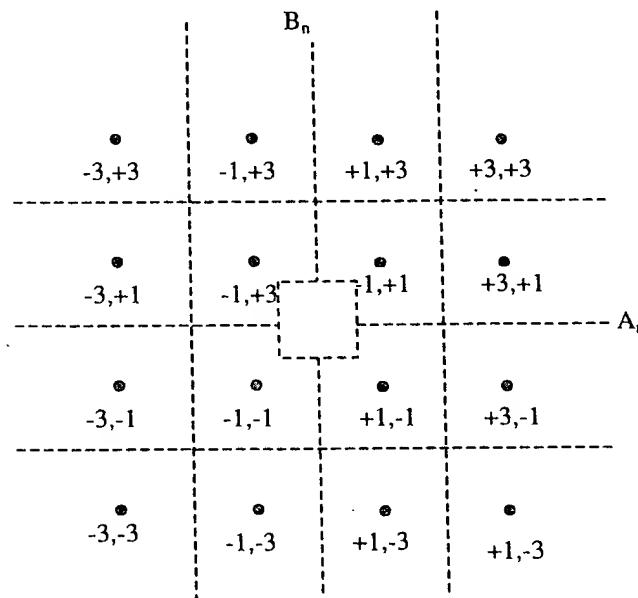


Figure 4 conventional zero detection approach

Advantages:

Simplicity, minimized error probability.

Commercial product(s) or other applications in which the invention may be used:
HomePNA transceivers

Explain how use of the invention would be detected:

EXHIBIT B

HITT GAINES & BOISBRUN, P.C.
INTELLECTUAL PROPERTY LAW & RELATED MATTERS



March 23, 2001

Gang Huang
AGERE SYSTEMS INC.
Room 1E323
101 Crawfords Corner Road
Holmdel, New Jersey 07733-3030

Re: U.S. Patent Application
"SYSTEM AND METHOD FOR RECOGNIZING ZERO-AMPLITUDE
SYMBOLS IN A QAM SIGNAL AND DIGITAL RECEIVER
INCORPORATING THE SAME"
IDS No.: 123586
Our File: AGER-123586

Dear Gang:

I enclose a proposed draft of the above-identified patent application for your review. I believe this draft incorporates all of your comments to date.

Please carefully review the enclosed application, along with any co-inventors. Please edit and make comments to the application, as appropriate (preferably in red ink). Your focus in reviewing the application is to ensure that the proposed application: (1) contains a clear and complete written description of your invention, (2) sets forth the best mode contemplated by you for carrying out the invention, and (3) contains a sufficient disclosure to enable a person skilled in the pertinent art to make and use the invention.

Upon completion of your review, kindly return the edited draft application and associated drawings to my attention in the envelope enclosed by April 11, 2001. If you have any questions or comments, please do not hesitate to call. Thank you once again for your continued cooperation.

Very truly yours,

HITT GAINES & BOISBRUN, P.C.

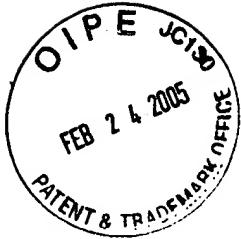
David H. Hitt

DHH/pg
Enclosure

EXHIBIT C

HITT GAINES & BOISBRUN, P.C.

INTELLECTUAL PROPERTY LAW & RELATED MATTERS



May 23, 2001

Mark A. Kurisko
Agere Systems Inc.
Room No. 59-115P
1247 S. Cedar Crest Blvd.
Allentown, Pennsylvania 18103

Re: U.S. Patent Application
Case Name: HUANG 11-1-10
Our File: AGER-123586

Dear Mark:

Enclosed is a copy of the above-referenced U.S. patent application, along with the accompanying drawings for your review. If the application meets with your approval, please provide us with your approval which is required before submitting the application for filing with the U.S. Patent and Trademark Office.

Do not hesitate to give me a call should you have any questions or comments.

Very truly yours,

HITT GAINES & BOISBRUN, P.C.

Glenn W. Boisbrun

GWB/AAC/sgp
Enclosure

EXHIBIT D



HITT GAINES & BOISBRUN, P.C.

INTELLECTUAL PROPERTY LAW & RELATED MATTERS

June 21, 2001

Gang Huang
AGERE SYSTEMS INC.
Room 1E323
101 Crawfords Corner Road
Holmdel, New Jersey 07733-3030

Re: U.S. Patent Application
"SYSTEM AND METHOD FOR RECOGNIZING ZERO-AMPLITUDE
SYMBOLS IN A QAM SIGNAL AND DIGITAL RECEIVER
INCORPORATING THE SAME"
Case Name: HUANG 11-1-10
Our File: AGER-123586

Dear Gang:

I enclose a final draft of the above-identified patent application for you and your co-inventor's review. I believe the final draft incorporates all of your comments to date. In addition, I enclose an Assignment and a Declaration and Power of Attorney.

If there are no further changes to the application, please execute the Assignment and Declaration and Power of Attorney, where indicated, along with your co-inventors. The Assignment assigns the entire interest in this invention to Agere Systems Inc. Please note that the Assignment must be notarized. Upon execution, kindly return these executed documents, together with the enclosed final draft of the application, to me for filing by **July 5, 2001**. Enclosed for your use is a return envelope.

It is important that all the inventors review a copy of the filed application, before executing the formal documents.

If you have any questions or comments, please do not hesitate to call. Thank you once again for your continued cooperation.

Very truly yours,

HITT GAINES & BOISBRUN, P.C.



David H. Hitt

DHH/sp
Enclosures